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ABSTRACT

The triannual newsletter, "Resources", published by Resources for the Future (RfF) typically contains excerpts from recent research in the area of natural resource development, conservation, and use. Announcements are also made of recent publications by RfF. Those interested in receiving the newsletter regularly should request that their name be placed on the mailing list. (JLB)

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OCT 26 1970

RESOURCES

Some findings and conjectures from recent research into resource development and use

The uncertainty and ignorance of Things to come makes the World new to us by unexpected Emergencies, whereby we pass not our days in the trite road of affairs affording no Novity . . .
SIR THOMAS BROWNE (1605-1682)

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Soil and Water in the Middle East

TWO OPINIONS about agriculture in the Middle East are widely held. One is that a region that was once the granary of the ancient world has played out its usefulness forever, exhausted its soils, denuded its forests, and has generally worn out its resources beyond repair. The other looks to water as the rejuvenator that can in short order restore the region to its former productiveness.

Both judgments are myths. As to the first, the region is not played out. With appropriate modern farm technology practices and management, and freed from restrictions, inhibitions, and rigidities that lie in the political, social, and institutional field, the natural resources of the Middle East could permit production on a vastly higher level. In a matter of two to three decades, more or less, agricultural output could be doubled in Egypt, multiplied tenfold in Iraq, and increased to intermediate degrees in the other countries.

As to the second, water alone is not the key. It is only one among many necessary inputs, and it is not now and will not for a considerable time be a limiting factor in most of the region. Indeed, neither water nor any other single input is the magic wand that will quickly and painlessly produce agricultural plenty and prosperity. There is a whole package of separate but closely interrelated programs that will lead to sustained advances in agriculture. An improved variety of wheat, grown in adequately irrigated and properly drained soil, with good land tillage and uniform seeding, nourished by enough fertilizers of the right kind, protected against weeds and infestations of diseases and insects, may be tremendously productive. The same wheat in an unimproved environment may produce little more than does the old variety.

Several properly coordinated improvements form the productive package; each part, alone, has limited value and under some conditions might even be a handicap. Nor will all of them suffice unless a variety of conditions can be met—unless the prices offered for the commodities produced can be counted on to leave a reasonable margin of profit; unless there are ways of obtaining necessary inputs at prices that permit this profit margin; unless the products can be easily moved to market, and so on.

In this context, water is an important ingredient. So are suitable soils to receive it. And suitable soils are probably scarcer in the Middle East than water. To make the package analogy does not mean that the significance of one component vis-à-vis another will not

SØ 000 300

vary from country to country, or that one remains powerless to move unless and until all the pieces are nicely lined up. It does mean, however, that sustained rapid agricultural progress will require much hard work, sound planning, and competent execution of plans over a period of years. It also means that nearly all of the ingredients for agricultural success in the Middle East must come from *within* the region. To be sure, outside help will be of value. Especially in the initial phase, new technology and new plant and livestock material from abroad will be indispensable; capital limitations may be eased by foreign grants or loans; and technical expertise may fill in shortages in locally available manpower. These aids are not to be underestimated. But basically, agricultural progress will either capture the imagination of the government and people of the country itself, or it will not take place.

WHAT WE REFER TO as the potential of Middle Eastern agriculture is more easily defined in terms of what it is not than what it is. It is not a forecast or projection for a given target date. Even less is it a program or a project or a group of projects. Instead, it is a racking up of output levels that could be achieved over the span of a generation or so on the basis of natural resource endowment, best practices now known and carried out elsewhere, and a favorable infrastructure that furnishes agriculture with what these practices require if they are to be effective in raising output.

So interpreted, potential grain production, perhaps the single most significant measure for a region in which grain is the staff of life, could rise from its present 11 million to 50 million tons. At that rate of output, the region would be a net exporter of grain in a volume that raises questions of export outlets. Production of other crops could rise similarly, in some instances perhaps even more sharply.

Another measure is gross income of agriculture, and here some rough calculations lead us to estimate the possibility of a rise from $3,500 million to $9,100 million a year. The degree to which such an increase would result in higher per capita income is, of course, dependent upon the rate of population growth. In general, one can judge that if present rates were to continue unchecked on the farm much if not most of the estimated growth in output would be dissipated with little increase in per capita income.

ACHIEVEMENT OF what we judge to be the potential of Middle Eastern agricultural resources might require additional annual outlays of roughly $1,000 million for fertilizer, of roughly $500 million for farm machinery including tractors, and of perhaps $500 million for other current physical inputs, above all pesticides and the like. Much, perhaps most, of the fertilizer, machinery, and other inputs could be produced within the region.

The advantages of a regional organization of agricultural supply are obvious in terms of lower cost and assured access. On such a basis, tractor manufacture, for example, might attain a volume sufficient to render it economically feasible within the region. Development of irrigation and drainage over some 25 years or so would cost in the neighborhood of $300 million per year, including cost of capital, operation, and maintenance. Then, the additional costs here identified would run in the order of $2,300 million per year. Compared with an estimated increase in gross output of about $5,500 million, this would not appear to be an infeasible proposition.

The opportunity to use natural resources and modern technology to more than double agricultural output, the necessity to overcome severely inhibiting institutional and cultural barriers and political uncertainties if the potential is to be realized, and the compelling need to accelerate economic growth before rapidly growing population makes such growth well-nigh impossible, all combine to present the Arab countries of the Middle East with a great challenge, no matter whether it be a doubling of output in Egypt or a rise of many hundred percent in Iraq or Syria.

To translate that challenge into a series of concrete steps is the task of administrators and planners who are intimately acquainted with a given country. But there is a useful checklist of things to keep in mind. First, in the absence of unlimited means, concentration of effort is likely to bear better fruit than dispersal of effort. A given locality, a given product, a given group of farmers—or any other well-identified sector that can be made to demonstrate dramatic improvement—will serve as a focus of attention and stimulate interest and then emulation. Second, a price structure that will allow farmers to make a good profit will lead them to abandon traditional ways and to assume what they will otherwise consider undue risks. Third, only a government convinced that it must put its agricultural house in order before it can embark on great forward drives elsewhere will be able to cope successfully with the many-sided problems associated with agricultural development. Fourth, agriculture is unlikely to advance as the result of pushing one particular input, be it water or fertilizer or the extension service. Only a convergence of different programs focusing on different aspects of the total problem will bring development.

Extracted from The Agricultural Potential of the Middle East, *by Marion Clawson, Hans H. Landsberg, and Lyle T. Alexander—a joint RFF-RAND study to be published shortly by American Elsevier Publishing Company.*

RESEARCHING THE ENVIRONMENT

LAST JUNE Resources for the Future held a small working conference under the leadership of Allen V. Kneese and Blair T. Bower, who are, respectively, director and associate director of RFF's Quality of the Environment program. The emphasis was on social science theory and method, not because there is not still much to be learned about physical causes and countermeasures, but because of the need for a whole new way of looking at pollution problems across the board.

As Kneese and Bower point out, traditional economic theory of natural resource use and allocation has little relation to many of the most pressing problems of environmental quality.

The air mantle, watercourses and oceans, landscapes, climate, and other common property resources, they point out, are becoming increasingly scarce and valuable; private property and market exchange have little applicability to their allocation, development, and conservation. "Man is not only overusing and misusing these resources, but is actually starting to affect the basic supply of some of them—for example, through inadvertent modification of weather, climate, and biota. Our understanding of these resources, and of the problems of management, analytical methods, policy, and institution-building which they present, is primitive."

Brief quotations from a few of the conference participants follow. All of the papers are being revised for later publication.

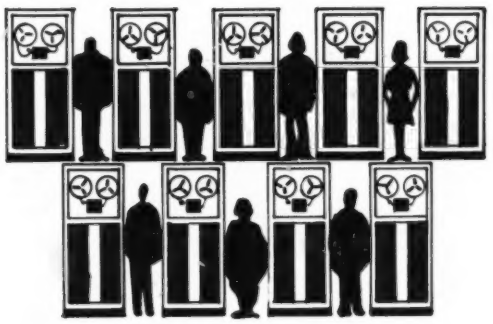
THE ANCIENT LEGAL notion that the ambient air is *res nullius*, the property of no one, is detrimental to rational policy making. So one job that lawyers have is to find a substitute concept. One effort in this direction has been to try to define resources like air as a commodity that is held in trust for the benefit of the entire community of citizens. If the citizenry is the beneficiary of the trust, its representatives should have the right to protect the values in air for themselves and their fellows. And government, which stands in the position of trustee to implement the trust for the public benefit, has an obligation to prevent uses of the air which impair the interests of the beneficiaries.

Put in concrete terms, this approach suggests that there is someone who can speak for the interest ordinarily represented by a property owner; and access to the "property" *can* in practice be controlled by the issuance of court orders enjoining the discharge of deleterious substances into the air. Thus, by building a legal construct, such as public trust doctrine, we can provide a workable substitute for market forces. Judicial protection of resource values against destruction or impairment imposes a price on resources such as the ambient air, usually in the form of a requirement that a nondestructive alternative be adopted. By having a doctrine which is suggestive of traditional property law approaches, we encourage courts to implement for the benefit of the general public (the beneficiaries of the trust) the standard legal principle, *sic utere tuo ut alienum non laedas*—use your own property in such a manner as not to injure that of another.—*Joseph L. Sax, University of Michigan.*

THE PRESENT GOVERNMENTAL structure which relates to environmental quality, particularly to air and water quality, bears very little relationship to representative government, the party system, or to social choices. In fact, most of the choices made consciously by governments are either made by technicians who try to "balance" the interests of the affected parties or by a small group of politicians who hide their choices behind a "technical" but meaningless benefit-cost analysis. We thus have the worst of both worlds—technical analysis that is debased by political judgments and by political deals in which only a small number, and perhaps the wrong people, may play.

In the past, technical, administrative, and executive agencies, using the devices of the public hearing and citizen or special interest advisory committees, may have been sufficient for the problems. We may be moving now to a time when representative governments, using technical and administrative advisory committees, are needed. For when true social choices are at stake, nothing less than representative governments making these choices will suffice. The spectacle of executive personnel attempting to assess the public interest through public hearings or to divine appropriate actions through committees "representing" all interests from housewives to steel mills is an outrage in the pure sense—it does violence to our system of government. In a technical sense it does not aggregate individual preferences correctly into social choices.—*Edwin T. Haefele, Resources for the Future.*

THE PROCESSES of extraction and pollution are common characteristics of any economy, from Robinson Crusoe's upward. They are not separable entities to be studied in isolation without regard to their physical and biological interdependencies unless the economy resides in an open resource system characterized by limitless natural resources, including airsheds and algae sinks. In fact, the rational utilization of the natural environment by man requires careful planning of rates of resource extraction and pollutant emissions, where one rate is highly dependent on the other. In a growing economy, recycling, savings rates, and rates of technical or physical obsolescence are intimately connected to resource use and residuals flows, and thus cumulative short-term government policies may have a long-term impact on the environment.—*Ralph d'Arge, University of California, Riverside.*



Social Goals and The Machine System

THE SCIENTIFIC community has traditionally resisted the notion that it should deal explicitly with social values and goals as a part of its enterprise. There has been a strong belief that the domain of values and goals is "off-limits" to science. The tradition of logical positivism, so strong in science, has held that judgments of value are merely emotional or verbal assertions removed from categories of truth and falsity—a position also characteristic of some Marxist and linguistic philosophers.

Two other factors were probably equally important. First, in that broad domain of physical concepts where a machine system paradigm is operational, science could make great advances without considering social goals and values. Taking these to be exogenously given, it could restrict its attention to operational rules or efficiency criteria. Second, there was a strong desire on the part of the science community to protect its life and growth from persecution by religious and political institutions that considered the realm of value their exclusive domain.

Economists and other social scientists have been inclined to be hypersensitive about their claim to a position in science. They have, accordingly, slavishly emulated the physical sciences. They have worked hard to apply to social phenomena the machine system concepts that have proven so fruitful in application to many physical phenomena. Successful applied social sciences have emerged where certain social phenomena can be reasonably approximated with machine system concepts (especially in economics). Limited success in some areas has encouraged them to continue applying the same concepts persistently and mistakenly to social phenomena that are manifestations of a process of social learning. They have also been conscientious in protecting their "scientific purity" by excluding issues of value as matters beyond legitimate concern of the objective social scientist.

THIS SENSE of professional insecurity may have reinforced, in turn, their attachment to deterministic models. The classical market equilibrium model of the economist, for example, is essentially the model of a machine system closed to new knowledge. In such a concept the economic system can be seen as occupied with purely instrumental goals (like producing bread or refrigerators) that are indirectly related to more general social goals considered as given. Under the control of such a model the economist can absorb himself with considerations of system efficiency yielding a static state optimum.

When he moves to a consideration of the phenomena of social development and is confronted with options for changing social behavior, the social scientist has greater difficulty in dodging the normative problems. Nevertheless, an attempt is made to carry the focus on instrumental efficiency over into the developmental realm. This may help explain the great appeal of the deterministic developmental models. Under the control of such concepts, a change in social behavior can be evaluated in terms of whether or not it efficiently contributes to the transformation leading to a predetermined terminal state. Even those who are concerned with stochastic models (e.g., game theory, decision theory, etc.) are primarily occupied with establishing the rule for efficient procedure in advancing or protecting established goals in the context of uncertainty and competition between the decision units. The nature of the goal and its transformation over time is not seen, itself, to be a function of the process.

Under the control of the social learning metaphor the goals must be acknowledged to be a function of the process. In evolutionary experimentation it is the goals that form the test of the developmental hypothesis, and through its practice the goals themselves are brought under periodic review and modification. If social science is to concern itself with the study of this process, it will be brought to an inescapable confrontation with the realm of values.

Extracted from Economic and Social Development: A Process of Social Learning, *by Edgar S. Dunn, Jr. (published for RFF by The Johns Hopkins Press, in press).*

RFF FALL BOOKS

Agricultural Development and Productivity: Lessons from the Chilean Experience. By Pierre R. Crosson. 200 pp., November 1970. Cloth, $7.00.

Drought and Water Supply: Implications of the Massachusetts Experience for Municipal Planning. By Clifford Russell, David Arey, Robert Kates. 248 pp. November 1970. Cloth, $8.00.

Economics and the Environment: A Materials Balance Approach. By Allen V. Kneese, Robert U. Ayres, Ralph C. d'Arge. 120 pp., December 1970. Paper, $2.50.

Foreign Investment in the Petroleum and Mineral Industries: Case Studies of Investor–Host Country Relations. By Raymond F. Mikesell et al. 478 pp. December 1970. Cloth, $15.00.

Economic and Social Development: A Process of Social Learning. By Edgar S. Dunn, Jr. 352 pp. December 1970. Cloth, $10.00.

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